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PATENT APPLICATION OF
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ENTITLED
WORK VEHICLE CAB SCREEN

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WORK VEHICLE CAB SCREEN

BACKGROUND OF THE INVENTION

The present invention relates to a cab side opening screen used on vehicles, such as a skid steer loader or similar vehicles, where a rollover protection cab is provided that has side openings over which screens are placed. The screens generally are made of a metal panel that is relatively thin and which has punched out rhombus holes with narrow webs or strips of material between the holes. In accordance with the present invention ribs are formed in the webs or strips to flatten the screens after punching the opening and reduce distortion and the "oil can" effect of the sidescreens.

Skid steer loaders have for many years utilized rollover protection type cabs that provide an overhead frame, and with screens or grates on side opening that provide operator visibility and that afford protection.

This type of screen is shown in various skid steer loader patents, for example, in design patents DES419,568 and DES317,926.

Patents 6,189,954 and 6,382,711 and U.S. patent application publication US2001/0008346 show the use of this type of sheet metal sidescreen or grate with stationary window assemblies that are attached to the screen. The side window assemblies in these two patents and the publication do not slide relative to the screens, but in some cases it is

desirable to have windows which can open by sliding a window section relative to the sidescreens or grates. Problems can arise if the screens or grills are not flat or which are bent, distorted or "oil canned".

5 Binding of the window sliding relative to the grill or sidescreen can occur.

SUMMARY OF THE INVENTION

The present invention relates to a sidescreen or grate for a cab on a work vehicle that

10 is formed from a metal panel or sheet with sufficient openings formed (punched) therethrough to permit the operator to see through it, but yet provide protection. The grills or screens are generally formed by punching rhomboid-shaped openings or

15 apertures, about 2 inches by 2 inches in size, in a metal sheet, leaving an integral matrix or network of intersecting steel strips or webs surrounding the openings.

The webs extend vertically and

20 horizontally, and according to the present invention, a majority of the webs are die formed to have ribs across the narrow dimension of the webs or strips. The ribs are formed about in the center of the length of each web or strip. The forming of the ribs

25 relieves stresses that are unavoidable when punching out openings that provide a high percentage of open space. After punching the openings in a side panel, the panel can be curved substantially from a plane.

The webs can be formed to be thinner in lateral width than is presently done using the teachings of the present invention. That means that visibility through the openings is increased, since
5 there would be a larger percentage of open space in the sheet remaining after punching out the openings. The sidescreen warp will also be overcome so it will be flat after forming the ribs.

The controlled sidescreen flatness as a
10 result of forming ribs in the individual strips or webs between the openings, in both vertical and horizontal directions, insures that sliding windows adjacent the screen are more easily accommodated.

The ribs are easily formed in a stamping
15 operation, using a suitable die. Forming the ribs on the horizontal webs in one direction perpendicular to the plane of the sidescreen (inwardly) and forming the ribs in the vertical webs in the other direction perpendicular to the plane of the sidescreen
20 (outwardly), also aids in insuring a flat screen.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a typical skid steer loader comprising an industrial work vehicle having a sidescreen made according to the
25 present invention;

Figure 2 is a side view of an industrial work vehicle cab, as shown, a skid steer loader cab, having a sidescreen made according to the present invention;

Figure 3 is an exaggerated, schematic representation of the curved or oil can shape of a sidescreen after punching openings in a panel and before adding the ribs of the present invention;

5 Figure 4 is an enlarged sectional view taken along line 4--4 in Figure 2;

Figure 5 is an enlarged sectional view taken as on line 5--5 in Figure 2; and

10 Figure 6 is a sectional view of a typical forming die used to form the ribs of the present invention in the webs between the openings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

By way of background, Figure 1 shows a skid steer loader 10 of conventional design that includes
15 a frame 12, mounted on wheels 14 that are driven through a suitable power train, such as hydraulic motors that in turn are driven from pumps. The pumps are driven from an engine 16 mounted in an engine compartment 18 that is to the rear of an operator's
20 cab or enclosure 20. The operator's cab is entered and exited from the front indicated at 22. Sidescreens 24 are provided along the sides of the cab, that provide visibility and protection. The cab includes a rollover protection framework 26, as is
25 common for an industrial work vehicle.

The loader shown has pivoting arms 27 that can be raised and lowered under power by operating hydraulic cylinders 28 in a normal manner. A bucket 29 or other tool is supported on the arms 27.

Figure 2 is an enlarged side view of the cab 26 showing a typical sidescreen 24. As can be seen, the sidescreen 24 is made with a plurality of rhomboid shaped openings indicated generally at 30, that are punched out of a panel or sheet 32 of metal which has solid webs or strips surrounding the openings 30. These openings 30 are formed in rows that are aligned generally horizontally, and also that are aligned in uprightly direction, slightly inclined from vertical lines.

The formation of the openings 30 in the individual rows will leave a series of parallel upright (called vertical) webs or strips 34, and a plurality of generally horizontal strips or webs 36. Thus each of the openings 30 is surrounded by two strips or webs 34 and two strips or webs 36, except for the openings that are at the edges, where a flange 38 of material is at the outer edge of the openings forming sidescreen 24.

The panel from which these sidescreens are made is generally in the range of 0.125 inches thick, although that thickness can vary as needed. The material generally is a mild steel that can be die formed and punched. Side screens having laser cut openings also are made, and material type and material thicknesses can vary when that manufacturing technique is used. The panel material is capable of permitting the openings 30 to be formed in a suitable manner.

The conventional sidescreens are generally distorted or warped, and not flat, after punching or forming the openings 30 defined by strips 34 and 36 due to stresses in the webs that remain. Figure 3 is
5 an exaggerated illustrative side view of a sidescreen 31 after punching openings, to illustrate the bowing or "oil can" effect. The sidescreen will curl from internal stresses, caused by punching the openings. In actual practice, the total distortion or bowing of
10 a free edge of a punched opening sidescreen can be six inches or so with one edge of the screen held on a floor surface.

The present invention includes another step in forming the sidescreens, to provide a transverse
15 or upset rib in a plurality, preferably a substantial number, such as most of the webs or strips 34 and 36.

Figure 4 is a sectional view taken through the vertical metal web strips 34, across two openings 30. As can be seen, the specific horizontal strips
20 indicated at 36A and 36B in Figure 4 (and all the other strips as desired) are formed with ribs 44, specifically ribs 44A and 44B, that are formed out of the plane of the respective strip a distance indicated by the double arrow 46. This depth of the
25 upset or formed rib is illustratively in the range of between 0.040 to 0.080 inches, with a preferred offset of about 0.063 using the 0.125 inch thick material. The depth of upset or displacement of the ribs, and the forming radius will be varied,

depending on the material composition, the thickness and the process used for forming the openings. The depths of the ribs is the distance from the top of the rib to the surface of the web from which it was
5 formed, as indicated by double arrows 46.

The ribs 44 extend across the width or lateral dimension of each one of a selected number or all of the webs or strips 36. The strips 36 are formed so the ribs 44 extend outwardly in a first
10 direction perpendicular to the plane of the panel 32. As shown, the ribs 44 extend inwardly into the plane of the paper.

Figure 5 is a sectional view taken across three of the strips 36, to show a view of ribs 50, as
15 shown, ribs 50A and 50B specifically, in webs or strips 34. These ribs 50A and 50B are formed in each of the strips 34, as shown strips 34A and 34B, but in an opposite direction perpendicular to the plane of the sidescreen from the direction of formation of the
20 ribs 44. In other words, the ribs 50 are formed out of the plane of the paper in Figure 2, and outwardly from the interior of the screen and cab. Again, the distance of offset of the ribs 50A and 50B is shown by double arrow 46 and is preferably the same offset
25 amount as ribs 44. The rib offset of the ribs in the horizontal webs can be different from the rib offset of the ribs in the vertical webs, as well.

The ribs 44 are preferably provided in substantially all, of the webs 36. Likewise, substantially all of the webs 34 have ribs 50.

5 The number of rows or lines of the ribs in each of the vertical or horizontal directions is a sufficient plurality to restore the side screen to a generally flat condition. Thus the selected number of webs or strips having the ribs is enough so the side screen remains generally flat.

10 Figure 6 is a view of a typical forming die for the ribs that includes a first punch member 70 and a second die member 72 in which a panel or sheet of material 74, which will become the sidescreen is positioned. The die 72 has a recess 76, and a punch
15 end 78 in punch member 70 is used to form a rib. The punch member 78 has an end formed in a radius selected to provide a desired inner radius of the rib. The formed rib is indicated at 80 in Figure 6 and is formed out of the screen or panel material 74.
20 The ribs can be formed in each of the vertical or horizontal sections, and all of the ribs can be die formed at one time.

Forming the ribs causes the panel to become flat and the formation of the ribs or upsets results
25 in the sidescreen staying flat. The openings 30 can be made larger when the webs are provided with the formed ribs as compared to the needed width of the webs without the ribs. Thus, there is a greater percentage of open space in the side screen. The

greater amount of open space that aids in visibility, while the screens are kept flat using the present invention.

Although the present invention has been
5 described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention.